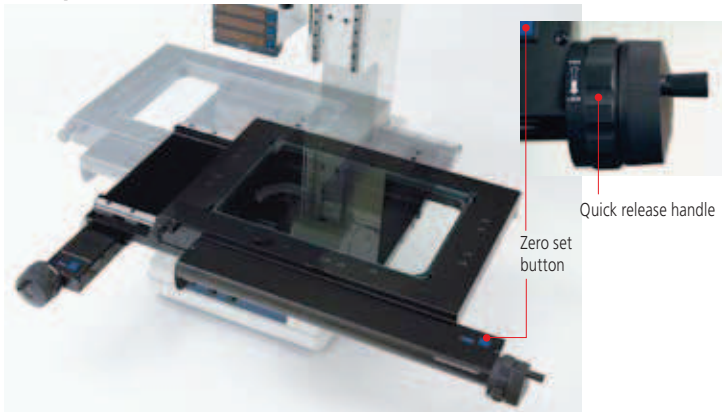
Quick Release Mechanism*1 and Zero-set Switch Incorporated*2 (Common to MF C and MF-U C)



The stage movement can be switched between extremely coarse and fine (FREE and LOCK) by using the quick release handles on the X and Y handles. These handles are useful for freeing the stage when the distance to the measurement position is long or you want to quickly return to a reference position.
Because this mechanism uses the twist roller method, switching causes little impact and enables smooth movement. Because the display zero-set switches are located near the handles*2, you can focus on the eyepiece during measurement and keep your hand near the handle almost all the time except when adjusting the focus.

*1: Patent pending (Japan)
*2: The zero-set buttons are located on the X and Y axes, not the Z axis.

Stage Variations Including Long Stroke
(Common to MF C and MF-U C)

MF-B4020C

Inspected objects vary in size.
Widely used in every industry, this series provides many measurement stroke variations.
This series offers a stage for long stroke measurement of 400×200×220mm in X, Y and Z. This is useful when measuring printed circuit boards, shafts, knife tools and other objects. Although the standard model has a Z-axis range of 220mm, the Z axis can be extended with a column upgrade.
A swivel rotation mechanism* is also provided as standard. This mechanism is useful when fixing an inspected object in parallel with the table movement direction.

*Only for models with a Y-axis range of 170mm or longer

Z-Axis Handles Provided on Both Sides of Standard Model (MF C and MF-U C)

MF C

MF-U C

Because the Z axis handles are placed on both sides of the column in standard models, the user can easily use one of them regardless of handedness.
The digital display can also be installed on either side of the column to set up an environment suited to the user's dominant hand.
Ergonomics have also been taken into consideration, and the handle is located in a position where a user of shorter stature can comfortably turn it.

Tilting Optical Tube of Standard Model
(MF-U C and MF-U D)

Comfortable observation is possible because the eye point can be adjusted to a position suitable for the user's stature.
The angle of the column can be fixed anywhere between 0° and 30°.
The reticle in the optical tube can be replaced.

Sliding Nosepiece
(Factory installed option for MF C and MF D)

Usually, only one objective lens can be attached to an MF instrument (limited compensation optical system), and this must be replaced to change the magnification.
Because up to two objective lenses can be attached to the sliding nosepiece, the magnification can be quickly changed when this option is specified.

Note) An external illumination source cannot be attached.

Universal Measuring Microscopes
MF-U Series (MF-U C)

MF-UB1010C

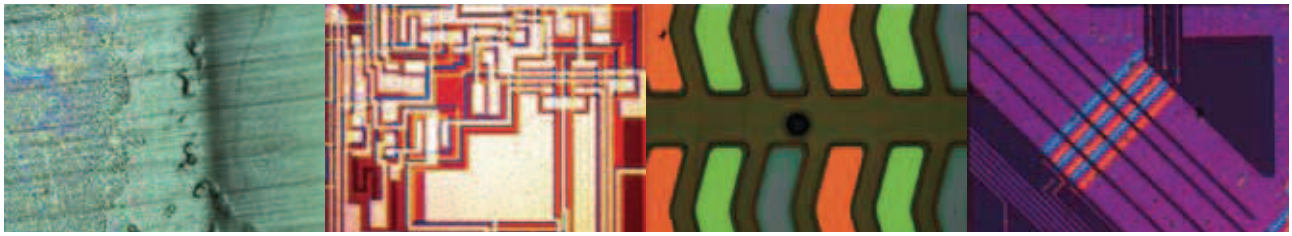
* The turret, objectives and illumination unit are optional accessories.

MF-UB2010C

* The turret, objectives and illumination unit are optional accessories.

Features

- Observation with a clear and flare-less erect image and a wide field of view
- Measuring accuracy that is the highest in its class (and conforms to JIS B 7153)
- Proven M Plan Apo/BD Plan Apo/G Plan Apo series, high-NA objectives from the FS optical system (long working distance type)
- Integration of metallurgical and measurement microscope functions provides a high-resolution observation and high-accuracy measurement solution
- Illumination unit (reflected/transmitted) selectable from a high-intensity LED or halogen bulb (required)
  * Only the halogen light source for transmitted illumination is provided as standard accessory. A seperate light source for transmitted illumination must be ordered additionally as optional accessory.
- Variable aperture diaphragm (reflected/transmitted) allows observation measurement while suppressing light diffraction
- Variety of standardized stages in sizes up to 400×200mm
- Quick-release mechanism useful for moving the stage quickly when measuring workpieces that are large in size or quantity
- Coarse/fine feed handles equipped as standard on both sides allow precise focus and observation measurement regardless of handedness
- High-magnification eyepiece observation up to 4000X (when using M Plan Apo SL200X)
- Standard measuring microscope that has a wide variety of optional accessories including a Vision Unit and various digital CCD cameras
- Low-noise design



Mitutoyo

MF-UB2017C

* The turret, objectives and illumination unit are optional accessories.

MF-UB3017C

* The turret, objectives and illumination unit are optional accessories.

MF-UB4020C

* The turret, objectives and illumination unit are optional accessories.

Specifications

BF (bright-field)	Without Z-axis scale	**Model No.**	**MF-UA1010C**	**MF-UA2010C**	**MF-UA2017C**	**MF-UA3017C**	**MF-UA4020C**
		Order No.	**176-668***	**176-669***	**176-670***	**176-671***	**176-672***
	With Z-axis scale	**Model No.**	**MF-UB1010C**	**MF-UB2010C**	**MF-UB2017C**	**MF-UB3017C**	**MF-UB4020C**
		Order No.	**176-688***	**176-689***	**176-690***	**176-691***	**176-692***
BD (bright-field/dark-field)	Without Z-axis scale	**Model No.**	**MF-UC1010C**	**MF-UC2010C**	**MF-UC2017C**	**MF-UC3017C**	**MF-UC4020C**
		Order No.	**176-674***	**176-675***	**176-676***	**176-677***	**176-678***
	With Z-axis scale	**Model No.**	**MF-UD1010C**	**MF-UD2010C**	**MF-UD2017C**	**MF-UD3017C**	**MF-UD4020C**
		Order No.	**176-694***	**176-695***	**176-696***	**176-697***	**176-698***

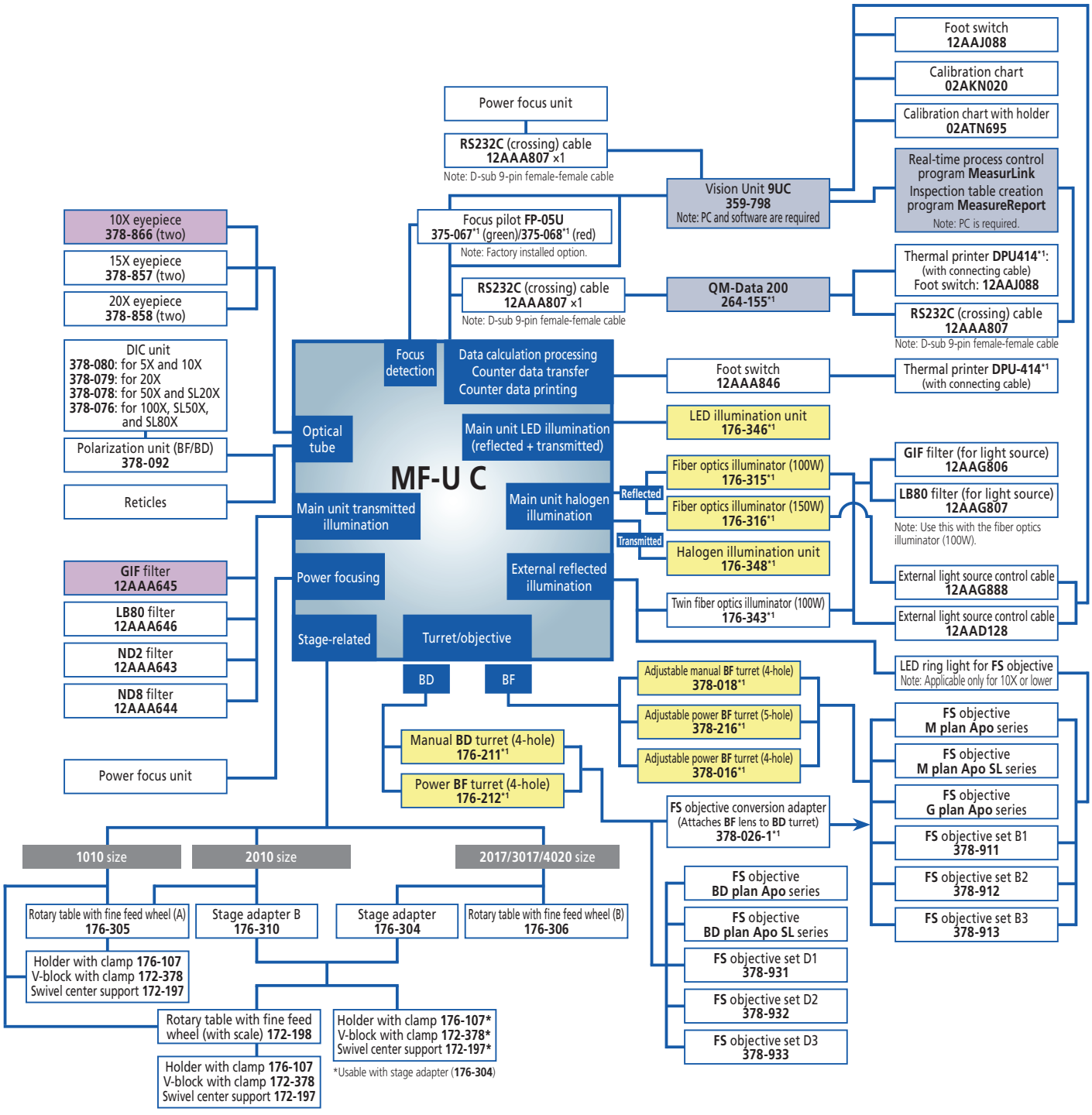
Optical tube		Tilting trinocular tube (angle of column: 0 to 30°), Siedentoph type (pupil distance adjustment: 51 to 76mm), built-in 1X tube lens, reticle (broken cross-hair, line width: 5µm), optical path switching (observation/TV camera = 50/50)				
Observation image		Erect image				
Observation method		BF, DF (only for MF-UC and UD types), simple polarization, differential interference				
Eyepiece (optional) Adjustable diopter		10X (eyepiece field number: 24, two eyepieces provided as standard), 15X, 20X				
Turret (required)	Bright-field (BF)	Adjustable manual turret or adjustable power turret (Select one.)				
	Bright-field/dark-field (BD)	Adjustable manual turret or adjustable power turret (Select one.)				
Objective (optional)	Bright-field (BF)	All lenses including the M Plan Apo, M Plan Apo SL, and G Plan Apo series				
	Bright-field/dark-field (BD)	All lenses including the BD Plan Apo and BD plan Apo L series				
Z axis	Max. workpiece height	150mm		220mm		
	Feed mechanism	Coaxial coarse and fine feed, handles on both sides (coarse: 10mm/rotation, fine: 0.1mm/rotation)				
Illumination unit		LED or halogen is required.				
Illumination filter		One GIF filter is provided as standard (and mountable for both transmitted and reflected illumination)				
Stage	Measuring range	100×100mm	200×100mm	200×170mm	300×170mm	400×200mm
	Tabletop size	280×280mm	350×280mm	410×342mm	510×342mm	610×342mm
	Effective stage glass size	180×180mm	250×150mm	270×240mm	370×240mm	440×240mm
	Swiveling angle	—		±5° (left)		±3° (left)
	Maximum table loading (glass top)	10kg		20kg		15kg
	Quick-release mechanism	Provided as standard for the X and Y axes				
	Zero-set button	Provided as standard for the X and Y axes (and for the Z axis only for the MF-UB and -UD types)				
Measurement system		High-accuracy digital scale*1				
Measuring accuracy*2 (X and Y axes, when not loaded)		(2.2+0.02L)µm, L: measuring length(mm)				
Digital display	Minimum reading	1/0.5/0.1µm switchable				
	Display axes	X and Y (or X, Y, and Z only for the MF-UB and -UD types)				
	Functions	Zero-setting, direction switching, RS-232C output				
Main unit dimensions (WxDxH)		562×730×667mm	624×745×667mm	632×892×782mm	682×892×782mm	757×907×782mm
Main unit mass		65.5kg	69.5kg	130kg	138kg	144kg
Control unit dimensions and mass		114(W)×330(D)×90.5(H)mm 2.0kg				
Maximum power consumption (with the illumination unit)		LED: 70W Halogen bulb: 70W*3				

* Note: The following suffixes are added to the order No. (e.g.: 176-668-10) to specify the User Manual's language: -10 for English; -11 for Chinese; No suffix for Japanese.

*1: Patent registered in Japan *2: Measured in conformance with JIS B 7153 *3: The value only in a transmitted illumination

Replacement halogen bulb (transmitted)	Standard: **513667** (12V/50W)
	Long life: **12BAB345** (12V/50W)

Replacement halogen bulb (reflected) (separate light source)	For details, see p.26.


MF-U C
Power focus unit
RS232C (crossing) cable 12AAA807 ×1
Note: D-sub 9-pin female-female cable
Vision Unit 9UC 359-798
Note: PC and software are required
Foot switch 12AAJ088
Calibration chart 02AKN020
Calibration chart with holder 02ATN695
Real-time process control program MeasurLink
Inspection table creation program MeasureReport
Note: PC is required.
10X eyepiece 378-866 (two)
15X eyepiece 378-857 (two)
20X eyepiece 378-858 (two)
Focus pilot FP-05U 375-067*1 (green)/375-068*1 (red)
Note: Factory installed option.
RS232C (crossing) cable 12AAA807 ×1
Note: D-sub 9-pin female-female cable
QM-Data 200 264-155*1
Thermal printer DPU414*1: (with connecting cable) Foot switch: 12AAJ088
RS232C (crossing) cable 12AAA807
Note: D-sub 9-pin female-female cable
DIC unit
378-080: for 5X and 10X
378-079: for 20X
378-078: for 50X and SL20X
378-076: for 100X, SL50X, and SL80X
Focus detection
Data calculation processing
Counter data transfer
Counter data printing
Foot switch 12AAA846
Thermal printer DPU-414*1 (with connecting cable)
Optical tube
Main unit LED illumination (reflected + transmitted)
LED illumination unit 176-346*1
Polarization unit (BF/BD) 378-092
Reticles
Main unit transmitted illumination
Main unit halogen illumination
Reflected
Transmitted
Fiber optics illuminator (100W) 176-315*1
Fiber optics illuminator (150W) 176-316*1
Halogen illumination unit 176-348*1
GIF filter (for light source) 12AAG806
LB80 filter (for light source) 12AAG807
Note: Use this with the fiber optics illuminator (100W).
External light source control cable 12AAG888
External light source control cable 12AAD128
GIF filter 12AAA645
LB80 filter 12AAA646
ND2 filter 12AAA643
ND8 filter 12AAA644
Power focusing
External reflected illumination
Twin fiber optics illuminator (100W) 176-343*1
Stage-related
Turret/objective
LED ring light for FS objective
Note: Applicable only for 10X or lower
BD
BF
Adjustable manual BF turret (4-hole) 378-018*1
Adjustable power BF turret (5-hole) 378-216*1
Adjustable power BF turret (4-hole) 378-016*1
Manual BD turret (4-hole) 176-211*1
Power BF turret (4-hole) 176-212*1
Power focus unit
FS objective conversion adapter (Attaches BF lens to BD turret) 378-026-1*1
FS objective M plan Apo series
FS objective M plan Apo SL series
FS objective G plan Apo series
FS objective set B1 378-911
FS objective set B2 378-912
FS objective set B3 378-913
1010 size
2010 size
2017/3017/4020 size
FS objective BD plan Apo series
FS objective BD plan Apo SL series
FS objective set D1 378-931
FS objective set D2 378-932
FS objective set D3 378-933
Rotary table with fine feed wheel (A) 176-305
Stage adapter B 176-310
Stage adapter 176-304
Rotary table with fine feed wheel (B) 176-306
Holder with clamp 176-107
V-block with clamp 172-378
Swivel center support 172-197
Rotary table with fine feed wheel (with scale) 172-198
Holder with clamp 176-107
V-block with clamp 172-378
Swivel center support 172-197
Holder with clamp 176-107*
V-block with clamp 172-378*
Swivel center support 172-197*
*Usable with stage adapter (176-304)
Vibration damping stand 176-308
Mounting stand (microscope + QM-Data 200) 176-309
Vertical system rack (for Vision Unit) 998923
*1: Order No. depends on the destination.
Lens cleaning set 12AAA165
Stage micrometer 375-056
Halogen lamp 12V 50W (transmitted) 513667
Long life type halogen lamp 12V 50W (transmitted) 12BAB345
Standard accessory
Required
For details, see catalog No. E14008

Optional Accessories
Lenses

Our eyepieces provide a wide field of view (with field number 24 when using 10X magnification) to enable easy observation and measurement of objects. The standard objectives provide a bright image with a long working distance and less flare. For both the bright-field and dark-field FS objectives, plan apochromat specifications are used. We think that being able to observe and measure objects without fatigue, even for long periods of time, is very important.

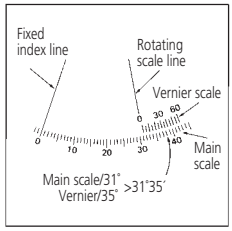
Eyepieces

Eyepieces

	WF10X/24	WF15X/16	WF20X/12
Order No. (1 piece)	**378-866-5**	**378-857-5**	**378-858-5**
Order No. (2 pieces)	**378-866**	**378-857**	**378-858**
Magnification	10X	15X	20X
Field number	24	16	12
Applicable model	**MF C / MF-U C / MF D / MF-U D**		

· Only the 10X model includes the eye shade.

· If using a measuring microscope older than the MF B series with a binocular eyepiece, select Order No. **378-866**.



Protractor Eyepiece

Order No.	**375-043**
Magnification	10X
Field number	21
Scale	360° 5′
Applicable model	**MF C / MF D**

Digital Protractor Eyepiece

Order No.		**176-313***1
Eyepiece detector unit	Magnification	10X
	Field number	22
	Reticle	Line width: 5µm for both 90° solid lines and 45° chain lines
	Measuring range	Degrees: 0.00° to ± 369.99° Arc-minutes: 0° 00′ to ± 369° 59′
	Detection method	Electrostatic capacitance encoder
	External dimensions (mm)	ø120×140(D)
Digital counter (standard equipment) Supports CE	Minimum reading	0.01° (degree) or 1′ (arc-minute)
	Function	Zero-set ABS*/INC selection, degree or arc-minute selection, data output (with foot switch **12AAJ088**)
	Output	RS-232C
	External dimensions (mm)	143(W)×112(D)×57(H)
	Power supply	AC100~120V
	Applicable model	**MF C / MF D** (fixable to the top surface of the counter)

*This measurement system does not always supply power to the internal scale to display absolute values. The system measures coordinates from any fixed origin.

*1 Order No. depends on the destination.

Optical Tubes

Monocular Tube

Order No.	**176-392**
Magnification	10X
Field number	24
Applicable model	Required for **MF C / MF D**

Binocular Tube

Order No.	**176-393**
Magnification	10X
Field number	24
Applicable model	Required for **MF C / MF D**

Tilting Binocular Tube

Magnification	10X
Field number	24
Angle of column (tilt angle)	0~30°
Applicable model	Included in **MF-U C / MF-U D** as standard

Mitutoyo

For inspection or observation using a microscope, high resolution and an ultra-long working distance are important factors for objective usability. Also, using the apochromat specifications (for correction of the red, blue, and yellow wavelengths) to correct chromatic aberration over a wide range of wavelengths and the plan specifications to correct distortion in the image surface, and point aberrations, is also important for getting a clear image across the whole field of view. Mitutoyo's high quality FS objectives have these characteristics, which expands the range of applications for a microscope and greatly improves its usability. These objectives are also helpful when installed in a measuring microscope. The M Plan Apo series and BD Plan Apo series are provided for bright-field observation. The SL (super long) specifications are available for when a long working distance is required. The G Plan Apo series is available corrected for observation through glass of thickness 3.5mm (or 2 to 5mm to special order).

ML objectives

Limited-correction optical system ... For **MF C / MF D**

Model No.	Order No.	Magnification	Numerical Aperture (N.A.)	Working Distance (mm)
ML 1X	**375-036-2**	1X	0.03	61.0
ML 3X	**375-037-1**	3X	0.09	77.0
ML 5X	**375-034-1**	5X	0.13	61.0
ML 10X	**375-039**	10X	0.21	51.0
ML 20X	**375-051**	20X	0.42	20.0
ML 50X	**375-052**	50X	0.55	13.0
ML 100X	**375-053**	100X	0.70	6.0

FS objectives

Infinity corrected optical system ... For **MF-U C / MF-U D**

For bright-field (**BF**) observation and measurement

Model No.	Order No.	Magnification	N.A.	Working Distance (mm)
M Plan Apo 1X	**378-800-3**	1X	0.025	11.0
M Plan Apo 2X	**378-801-3**	2X	0.055	34.0
M Plan Apo 5X	**378-802-6**	5X	0.14	34.0
M Plan Apo 7.5X	**378-807-3**	7.5X	0.21	35.0
M Plan Apo 10X	**378-803-3**	10X	0.28	33.5
M Plan Apo 20X	**378-804-3**	20X	0.42	20.0
M Plan Apo 50X	**378-805-3**	50X	0.55	13.0
M Plan Apo 100X	**378-806-3**	100X	0.70	6.0
M Plan Apo SL 20X	**378-810-3**	20X	0.28	30.5
M Plan Apo SL 50X	**378-811-3**	50X	0.42	20.5
M Plan Apo SL 80X	**378-812-3**	80X	0.55	15.0
M Plan Apo SL 100X	**378-813-3**	100X	0.70	13.0
M Plan Apo SL 200X	**378-816-3**	200X	0.62	13.0
M Plan Apo HR 50X	**378-814-4**	50X	0.75	5.2
M Plan Apo HR 100X	**378-815-4**	100X	0.90	1.3
G Plan Apo 20X (t3.5)	**378-847**	20X	0.28	Air conversion: 29.42
G Plan Apo 50X (t3.5)	**378-848-3**	50X	0.50	Air conversion: 13.89
Lens set B1	**378-911**	A set including M plan Apo 10X, 20X, 50X, and 100X		
Lens set B2	**378-912**	A set including M plan Apo 2X, 5X and SL20X		
Lens set B3	**378-913**	A set including M plan Apo 5X, 10X, 20X, and 50X		
Replacement adapter for FS objective	**378-026-1**	Used when a bright-field (**BF**) lens is attached to a bright-field and dark-field (**BD**) turret		

For observation and measurement using a bright-field or dark-field (**BD**)

Model No.	Order No.	Magnification	N.A.	Working Distance (mm)
BD Plan Apo 2X	**378-831-7**	2X	0.055	34.0
BD Plan Apo 5X	**378-832-7**	5X	0.14	34.0
BD Plan Apo 7.5X	**378-830-7**	7.5X	0.21	34.0
BD Plan Apo 10X	**378-833-7**	10X	0.28	33.5
BD Plan Apo 20X	**378-834-7**	20X	0.42	20.0
BD Plan Apo 50X	**378-835-7**	50X	0.55	13.0
BD Plan Apo 100X	**378-836-7**	100X	0.70	6.0
BD Plan Apo SL 20X	**378-840-7**	20X	0.28	30.5
BD Plan Apo SL 50X	**378-841-7**	50X	0.42	20.0
BD Plan Apo SL 80X	**378-842-7**	80X	0.50	13.0
BD Plan Apo SL 100X	**378-843-7**	100X	0.55	13.0
BD Plan Apo HR 50X	**378-845**	50X	0.75	5.2
BD Plan Apo HR 100X	**378-846**	100X	0.90	1.3
Lens set D1	**378-931**	A set including BD plan Apo 10X, 20X, 50X, and 100X		
Lens set D2	**378-932**	A set including BD plan Apo 2X, 5X, and SL20X		
Lens set D3	**378-933**	A set including BD plan Apo 5X, 10X, 20X, and 50X		

* Refer to Catalog No. E4191 "MICROSCOPE UNITS AND OBJECTIVES" for details.

Optional Accessories
Illumination

How illumination (a light source) is used is important for observing and measuring various inspected objects such as semiconductors, electronic or electric components, automobile precision components, resin moldings, tools, medical products, and printed materials with clarity and high contrast. Select the best illumination according to the shape, surface conditions, color, and materials in the inspected object.

A: Reflected illumination and transmitted illumination (required)

①

LED Illumination Unit	
Order No.	**176-345 (MF C) /176-445(MF D)**
	Made up of lamp housing (for reflected illumination and transmitted illumination) and an LED control unit. The LED control unit can be fixed to the rear of the column of the microscope main unit. White light LED (low power consumption: 65W) Rated life of approximately 30,000 hours continuously variable brightness control Built-in cooling fan (includes an alarm for indicating that the fan has stopped) A color filter can be attached to a reflected or transmitted illumination unit.
External dimensions (mm)	Reflected illumination unit: ø33×86 (maximum protrusion)
	Transmitted illumination unit: 68×103 (maximum protrusion)
	LED control unit: 118(W)×365(D)×96(H)
Applicable model	**MF C/MF D**

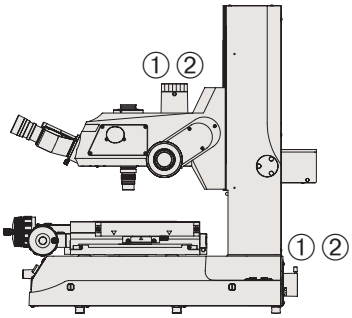
* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-345A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **C** for Taiwan, No suffix is required for JIS/100V

③

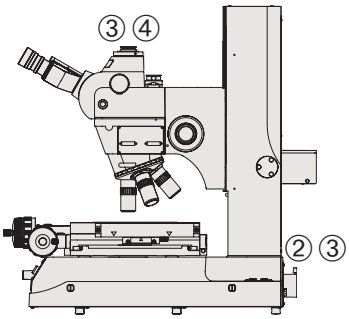
LED Illumination Unit	
Order No.	**176-346 (MF UC) /176-446(MF UD)**
	Made up of lamp housing (for reflected illumination and transmitted illumination) and an LED control unit. The LED control unit can be fixed to the rear of the column of microscope main unit. White light LED (low power consumption: 70W) Rated life: Approximately 30,000 hours Continuously variable brightness control Built-in cooling fan (includes an alarm for indicating that the fan has stopped) A color filter can be attached to a reflected or transmitted illumination unit.
External dimensions (mm)	Reflected illumination unit: 68×66 (maximum protrusion)
	Transmitted illumination unit: 68×103 (maximum protrusion)
	LED control unit: 118(W)×365(D)×96(H)
Applicable model	**MF-U C/MF-U D**

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-345A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **C** for Taiwan, No suffix is required for JIS/100V

MF series



MF-U series



②

Halogen Illumination Unit	
Order No.	**176-347 (MF C)/176-348 (MF-U C) /176-447 (MF D)/176-448 (MF-U D)**
	Made up of lamp housing (for reflected illumination and transmitted illumination) and a halogen control unit. The halogen control unit can be fixed to the rear of the column of the microscope main unit. 12V, 50W halogen lamp, continuously variable brightness control Built-in cooling fan (includes an alarm for indicating that the fan has stopped) A color filter can be attached.
External dimensions (mm)	Reflected and transmitted illumination unit: 91×106 (maximum protrusion)
	Halogen control unit: 118(W)×365(D)×96(H)
Applicable model	**MF C/MF-U C/MF D/MF-U D**

Note: MF-U C is available only for transmitted illumination.

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-345A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **C** for Taiwan, No suffix is required for JIS/100V

④

100W and 150W Fiber Optics Cable Illumination Unit (External Light Source)	
Order No.	**176-315* (100W) ·176-316* (150W)**
100W	12V, 100W halogen lamp (No. **517181**) Rated life: 1,000 hours
	12V, 100W high brightness halogen lamp (No. **12BAD602**) Rated life: 50 hours
	Continuously variable brightness control
External dimensions (mm)	76(W)×235(D)×120(H), Fiberglass cable length: 1,500
150W	15V, 150W halogen lamp (No. **12BAJ076**) Rated life: 500 hours
	15V, 150W high brightness halogen lamp (No. **12BAJ075**) Rated life: 50 hours
	Continuously variable brightness control
External dimensions (mm)	120(W)×273(D)×119(H), Fiberglass cable length: 1,500
Applicable model	For reflected illumination when selecting the halogen illumination unit with **MF-U C / MF-U D**

* Order No. depends on the destination.

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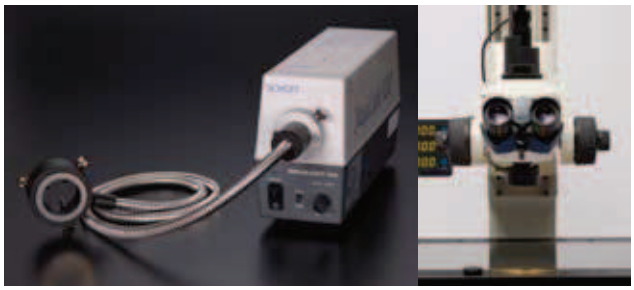
B **Dual swan-neck light pipe (External Light Source)**

Order No.	**176-343***
	Fixed to the rear of the microscope column. Continuously variable brightness control Includes a condenser lens Auto-brightness control can be used for the Vision Unit system (with external light source control cable No. **12AAD128**). 12V, 100W halogen lamp (No. **517181**), rated life: 1,000 hours 12V, 100W high brightness halogen lamp (No. **12BAD602**), rated life: 50 hours LB80 filter (No. **12AAG807**)
External dimensions (mm)	76(W)×235(D)×120(H): includes only the light source
	Fiber optics cable length: 700 (from the rear fixed portion to the front edge)
	Maximum fiber bending radius: 60
Applicable model	**MF C / MF-U C / MF D / MF-U D**

* Order No. depends on the destination.



C **Fiber-Optic Ring Light (External Light Source)**

Order No.	**176-366***
	Continuously variable brightness control Includes a condenser lens Auto-brightness control can be used for the Vision Unit system (with external light source control cable No. **12AAD128**). 12V, 100W halogen lamp (No. **517181**) Rated life: 1,000 hours 12V, 100W high brightness halogen lamp (No. **12BAD602**) Rated life: 50 hours LB80 filter (No. **12AAG807**)
External dimensions (mm)	76(W)×235(D)×120(H): includes only the light source
	Circular illumination unit: outside diameter: 60, inside diameter: 35
	Maximum fiber length: 1,000
Applicable model	**MF C / MF D** (ML objective 10X or lower model)

* Order No. depends on the destination.

A: Reflected and Transmitted Illumination

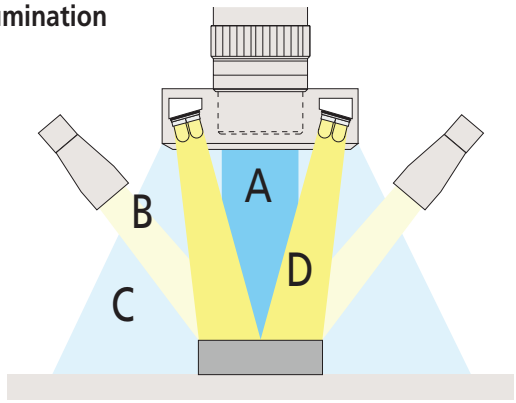
The light is projected vertically downward onto the surface of an inspected object through an objective. An LED or halogen lamp is selectable as the light source.

Image

B: Dual swan-neck light pipe

Light piped from a standalone halogen lamp unit and projected from two heads is suitable for three-dimensional observation. The condenser lens included as standard makes high brightness spot lighting possible.

Image



The four images show the same portion of an inspected object.

C: Fiber-Optic Ring Light

Light piped from a standalone halogen lamp unit and projected from around the objective enables observation that is less affected by shadows due to surface irregularities and is suitable for image measurement.

Image

D: LED Ring Light

Light from an LED array surrounding the objective enables high contrast observation of deeply colored resins, circuit boards, and small cylindrical objects and is also suitable for image measurement. In addition, adjusting the brightness does not change the coloring.

Image

D **LED Ring Light**

Order No.	**176-367-2***
	Continuously variable brightness control Auto-brightness control can be used for the Vision Unit system (with external light source control cable No. **12AAG888**).
External dimensions (mm)	75(W)×150(D)×90(H): only the control part
	Ring LED part: outside diameter: 70, height: 68 to 93
	LED cable length: 1,500
Applicable model	**MF C / MF D** (ML objective 10X or lower model)

* Order No. depends on the destination.

D **LED Ring Light (for FS Objectives)**

Order No.	Please contact us.
	Fixed to an objective and projects ring-shaped white LED light Continuously variable brightness control Auto-brightness control can be used for the Vision Unit system (with external light source control cable No. **12AAG888**).
External dimensions (mm)	75(W)×150(D)×90(H): only the control part
	Ring LED part: outside diameter: 70, height: 65 to 80
	LED cable length: 1,000
Applicable model	**MF-U C / MF-U D** (FS objective M plan Pro 10X or lower model)

Manual Image Measurement Vision Unit

The Vision Unit turns your measuring microscope into a high-performance vision measuring system capable of significantly increasing productivity in quality assurance operations. Vision measurement simply involves generating enough points from the edges of workpiece features to ensure accuracy and then letting powerful PC-based software calculate the measurement results. An image measuring model that aligns edges during image measurement and a dedicated electronic model that can be used for general purposes are available. Both models can print out the measurement results or output them to spreadsheet software or inspection tables.

Typical system

For details, see Catalog No. E14008

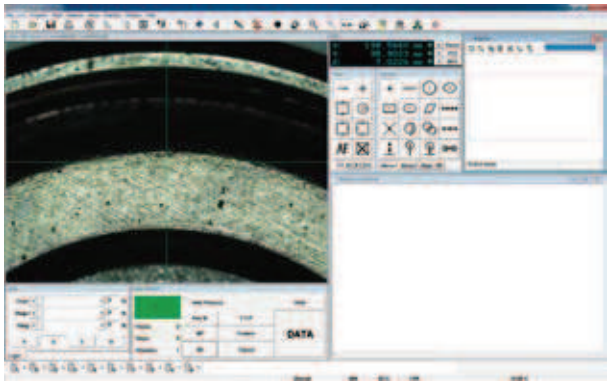
Features

- Auto edge detection tool and various macro icons make measurement straightforward
- Easy-to-use graphics and measurement navigation
- Enables measurement results to be output to MS-Excel*1 and an inspection table created on the same PC
- Enables tolerance zone analysis for measurement and calculation results, and various types of statistical processing for each item
- Auto-brightness control that precisely duplicates an illumination setting (when using the measuring microscopes MF C, MF-U C, MF-D and MF-UD together)
- Enables high-accuracy height measurement when combined with the focus pilot
- Enables measurement within one screen
- Images can be input or saved (in BMP or JPEG format).

*1. MS-Excel is a Microsoft product.

More user-friendly manual measurement environments available (Wide-field measurement)

Upsizing of the image sensor has made the field of view approximately 40% wider than conventional for both X and Y directions, thus allowing concurrent observation of the circumference of a measurement point.



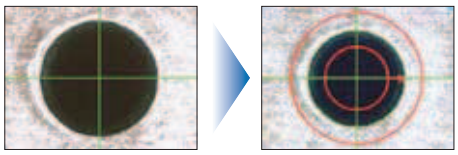
* An actual image using objective lens ML1X plus LED ring light

Edge detection support tools (One-click tools)

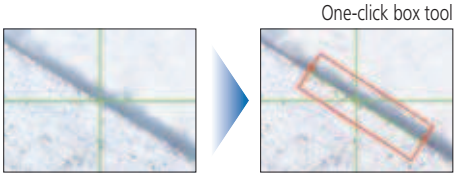
[Patent registered (application country: Japan)]

Each tool has the function of automatically discriminating operations from self tool setup to edge detection/calculation by merely single-clicking the vicinity of a measurement point edge with the mouse. If measurement is performed in one tool window, these tools drastically reduce measurement time thanks to no need for stage travel.

One-click circle tool



One-click box tool

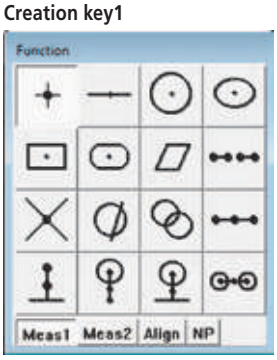


Mitutoyo

Coordinate system creation key

Coordinate system

Creation key1



Creation key2

Coordinate value input formatting function (NP measurement)

Specifications

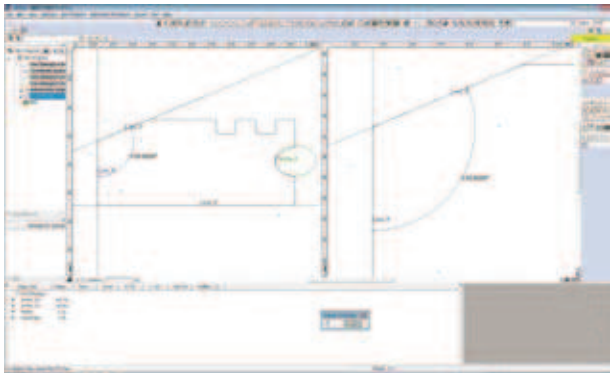
Vision Unit	
Order No.	MF C: No. **359-796** (Vision Unit 9C) / MF-UC: No. **359-798** (Vision Unit 9UC) / MF D & MF-UD: **359-763** (Vision Unit 10D)
Magnification of optical system	0.5X: when a microscope is attached (0.5X: when using a TV adapter)
Image detection	High sensitivity 1/2-inch CMOS color camera with 300 million pixels
Resolution	0.1µm
Measuring accuracy for each axis (in a 20°C environment)	Depends on measuring microscope
Accuracy (in a 20°C environment)	Depends on measuring microscope Reference: when using a 3X ML objective (performing an inspection using our standard sample) Screen-internal measuring accuracy: ±2.5µm or less Screen-internal repeatability (2σ): ±1µm or less
PC system*	Windows 7
Software*	QSPAK Vision Unit
Applicable model	**MF C / MF-U C / MF D / MF-U D**

* Software (QSPAK) and calculation processor are required separately.

FORMPAK-QV (Optional software)

FORMPAK-QV allows contour analysis and contour tolerancing against the nominal value, from the data acquired using QSPAK.

- Contour tolerancing function
- Fine contour analysis function
- Report generation function

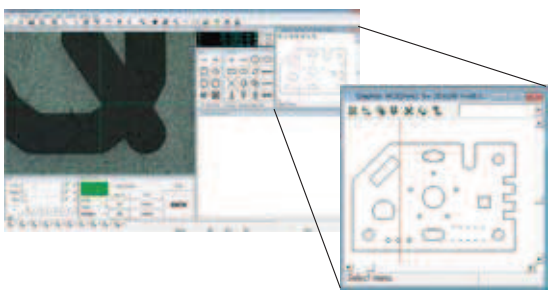


CAD Import & Export (Optional software)

Operability has been greatly improved, and the time required to create a part program has been greatly reduced, by importing the CAD data (DXF, IGES), as generated at the product-design stage, to QSPAK. The measurement result from QSPAK can be converted to CAD data.

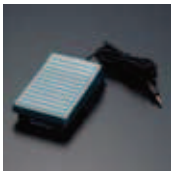
FEATURES

- The nominal value of each measuring item is entered automatically.
- The graphics window can be used to calculate elements.
- Graphics data can be output in a specified CAD data format.



2-D Data Processing Unit
QM-Data 200

Typical system



Foot switch No. **12AAJ088**

Features

- Displays high contrast color graphics on a large, backlit, LCD screen
- Enables frequently-performed complex measurement (such as measuring the distance between two circles) to be performed by pressing just one button
- Teaching function for measuring procedure
  Efficient measurement by performing measuring point navigation in the repeat mode
- Eliminates the need to switch measuring command keys through AI-based measurement (which automatically determines the measured element)
- Includes a user menu in which you can individually register measuring commands or part programs
- Enables tolerance zone measurement for measurement and calculation results, and various types of statistical processing for each item
- Enables measurement results to be output to the MS-Excel*1 PC spreadsheet software in CSV format
- Enables part programs and measurement results to be stored in USB memory*2 or on a USB-FDD (floppy disk)
- A stand that can be tilted to adjust the angle to an easily viewable position
- Enables measurement during printing

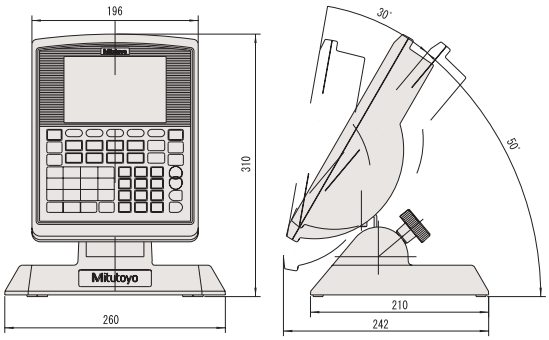
*1. MS-Excel is a Microsoft product.
*2. Not all commercially available USB memory is supported.

Specifications

QM-DATA 200 (Stand Type)	
Order No.	**264-155***
Displayed language	Switched among 16 languages (Japanese, English, French, German, Italian, Spanish, Portuguese, Czech, Chinese (traditional), Chinese (simplified), Korean, Turkish, Swedish, Polish, Dutch and Hungarian
Unit of measurement	Length: mm, angle: degree/degree-minute-second (switchable)
Resolution	0.1µm
Program function	Creating, performing, and editing measuring procedures
Statistical processing	The measured item, number of data items, maximum value, minimum value, average value, standard deviation, range, histogram, and statistics for each measuring function (statistics for each command)
Display field	Color TFT LCD (with a backlight)
Tilt feature	Available
I/O connector	XYZ: for linear scale input ... up to 3 axes RS-232C ①: for connecting a PC (measuring result) RS-232C ②: for connecting the counter of the measuring machine main unit FS: for connecting a foot switch PRINTER: for connecting a receipt or external printer (measuring result) USB-FDD: for connecting a USB-FDD (measuring result file, measuring procedure file) USB-MEMORY: for connecting USB memory (measuring result file, measuring procedure file)
File output of measuring result	RS-232C output (CSV format, MUX-10 format)
Power supply	100V to 240V AC
Maximum power consumption	17W (without including options)
External dimensions (mm)	Approximately 260×242×310mm (including a stand)
Weight	Approximately 2.9kg
Applicable model	**MF C / MF-U C / MF D / MF-U D**

* Order No. depends on the destination.

External dimensions (unit: mm)



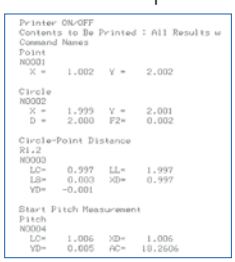
Thermal printer

DPU-414 Manufactured by SII

Specifications

Thermal Printer DPU-414		
Order No.	Connected to QM-Data 200	Please contact with your local Mitutoyo sales office.
	Counter display printing	Please contact with your local Mitutoyo sales office. Note: Combined use with footswitch No. **12AAA846**
Printing method		Dot-matrix thermosensitive
Number of printing digits		40 digits (9 normal characters (7 dot matrix)
Printing speed		Maximum 52.5 normal characters/s
External dimensions		160mm(W)×170mm(D)×65.5mm(H) (printer)
Standard accessories		Printer cable, printing paper (1 roll), AC adapter (for 100V)
Spare goods	Printing paper (5 rolls)	**No. 908353** (5 rolls)

Printout example



Other Optional Accessories

We offer various optional accessories designed to increase microscope usability. These optional accessories, which have all been well received by customers, include the focus pilot, which can reduce focal point variation; a power turret and power focusing unit, which can be used to change the focus or magnification by under precise power control and a rotary table, which has a fine-adjustment knob for comfortably rotating objects under inspection. You can also select the polarization and differential interference contrast unit to support microscopic observation, the TV port adapter to attach a camera, which is required by many people during simultaneous analysis and evaluation, and other optional accessories as required.

Focus Detection Unit Focus Pilot

Model type	FP-05	FP-05U
Order No.	**375-057*** (Green) / **375-058*** (Red)	**375-067*** (Green) / **375-068*** (Red)
Light Source	Green LED or Red LED •Concentric circle pattern •Slit pattern • The focal point is the position where the top and bottom of the pattern are aligned. • The brightness can be adjusted according to the reflectivity of the surface. • Observation with a wide field of view on a TV monitor using 5X optical magnification is available.	
Focusing reproducibility	Approximately 1.5µm (when using a 20X lens) ... This is a reference value based on an inspection performed using our standard sample.	
Optical magnification	0.5X	
Magnification accuracy	± 0.1% (within 2/3 of the center of the field of view)	
Camera	Supports up to 2/3 inch	
TV adapter	Equipped with C-mount, centering or parfocal adjusting mechanism	
Power supply	100 to 240V AC, Maximum power approximately 10W	
External dimensions (mm)	Main unit: 131(H) Console box: 90(W)×78(H)×178(D)	
Applicable model	**MF C / MF D**	**MF-U C / MF-U D**

Note: The combination of MF-U and FP-05U is a factory-installed option.
* Order No. depends on the destination.

Slide Type Nose Pieces (Factory-installed Option)

Order No.	**176-314-1** The lens mounted at the centering mechanism (standard) position and the lens mounted at the focal point adjusting mechanism position are parfocal. Note: The magnification of the lens mounted at the focal point adjusting mechanism position is not guaranteed.
Order No.	**176-314-2** Magnification of the lens mounted at the centering mechanism (standard) position and that of the lens mounted at the focal point adjusting mechanism position are guaranteed. Note: The two lenses are not parfocal.
Applicable model	**MF C / MF D**

Note: An external light source is not available with this product.

Electric Focus Unit

Order No.	Please contact with your local Mitutoyo sales office.
	Attached to the Z-axis handle on the left side of the microscope to allow fine focus adjustment by turning the electric jog dial by hand. By using a jog shuttle, the variable speed coarse feed focus can be changed in 7-levels.
Maximum feed	0.4µm
Maximum drive speed	3.2mm/s
Driving method	Stepping motor (jog shuttle/jog dial)
Power supply	100 to 240V AC Maximum power consumption: approximately 20W
External dimensions (mm)	Main unit: ø69×99(L) Console box: 108(W)×72(H)×193(D)
Applicable model	**MF C / MF-U C**

Note: This unit is made to order.

Turrets

Order No.	176-211	378-018	176-212*	378-016*	378-216*
Supported observation	For bright-field and dark-field (BD)	For bright-field (BF)	For bright-field and dark-field (BD)	For bright-field (BF)	For bright-field (BF)
Number of ways	4	4	4	4	5
Centering and parfocal mechanism	—	Standard fixed: 1 position Centering and parfocal: 3 positions	—	Standard fixed: 1 position Centering and parfocal: 3 positions	Standard fixed: 1 position Centering and parfocal: 4 positions
Driving method	Manual		Electric		
Power supply	—	—	100 to 240V AC		
External dimensions (mm)	—	ø110×51(H)	Turret: 164(W)×65(H)×137(D) Console box: 108(W)×72(H)×193(D) Cable length: 3m		
Applicable model	Required for **MF-U C / MF-U D**				

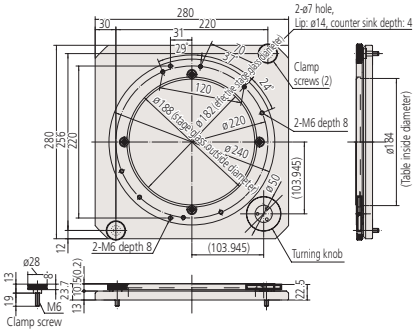
* Order No. depends on the destination.

Other Optional Accessories

Rotary Table with Fine Feed Wheel (A)

Order No.	**176-305**
External dimensions	280(W)×280(D)×23.7(H)mm Tabletop: ø240mm, 360° rotation, no angle scale
Mass	5.5kg
Effective glass diameter	182mm
Applicable model	Size 505, 10101, 2010 (**MF C / MF-U C**)

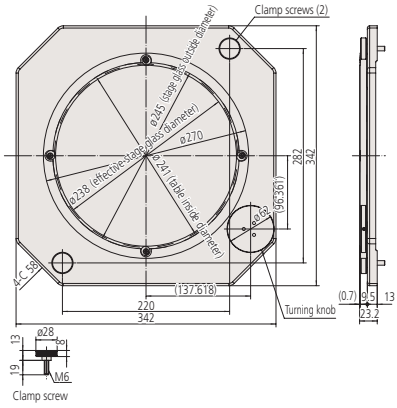
Note: The V-block with Clamp, Swivel Center Support and Holder with Clamp can be mounted on the table.

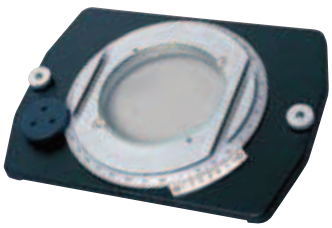


Rotary Table with Fine Feed Wheel (B)

Order No.	**176-306**
External dimensions	342(W)×342(D)×23.2(H)mm Tabletop: ø270mm, 360° rotation, no angle scale
Mass	6.5kg
Effective glass diameter	238mm
Applicable model	Size 2017, 3017, 4020 (**MF C / MF-U C / MF D / MF-U D**)

Note: The V-block with Clamp, Swivel Center Support and Holder with Clamp can be mounted on the table.

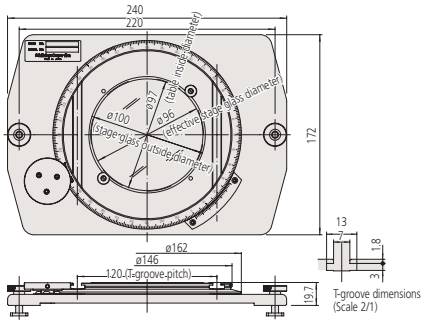




Rotary Table with Fine Feed Wheel (with Scale)

Order No.	**172-198**
External dimensions	240(W)×172(D)×19.7(H)mm T-groove pitch of the tabletop: 120 Tabletop: ø270mm, 360° rotation, minimum angle adjustment: vernier 2'
Mass	2.4kg
Effective glass diameter	96mm
Applicable model	**MF C / MF-U C** Note: Size 2010 is used with stage adapter B Sizes 2017, 3017, and 4020 are used with stage adapter

Note: The V-block with Clamp, Swivel Center Support and Holder with Clamp can be mounted on the table.

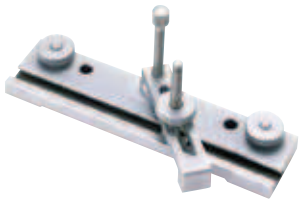


V-block with Clamp

Order No.	**172-378**
	Maximum clamping diameter: 25mm Height from the mounting surface to the center: 38 to 48mm
External dimensions (mm)	117(H)×90(W)×45(D)
Mass	0.8kg
Applicable model	**MF C / MF-U C / MF D / MF-U D** Note: Size 2010 is used with stage adapter B. Sizes 2017, 3017, and 4020 are usable with stage adapter

Swivel Center Support

Order No.	**172-197**
	± 10° for swivel position Minimum angle index: 1° Suitable for measuring screws or other objects Maximum horizontal clamping size: ø80×140mm Maximum clamping size when inclined 10°: ø65×140mm
Mass	2.5kg
Applicable model	**MF C / MF-U C / MF D / MF-U D** Note: Size 2010 is used with stage adapter B. Sizes 2017, 3017, and 4020 are used with stage adapter



Holder with Clamp

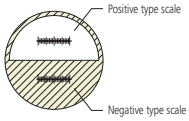
Order No.	**176-107**
Maximum clamp length (mm)	35
External dimensions (mm)	62(H)×152(W)×38(D)
Mass	0.4kg
Applicable model	**MF C / MF-U C / MF D / MF-U D** Note: Size 2010 is used with stage adapter B. Sizes 2017, 3017, and 4020 are usable with stage adapter

Stage Adapter / Stage Adapter B

Order No.	**176-304** (for 2017, 3017, 4020) **B: 176-310** (for 2010)
External dimensions for one piece (mm)	50(W)×340(D)×15(H) Note: Adapter B is 280(D).
Mass	1.5kg / B: 1.2kg
Applicable model	**MF C / MF-U C / MF D / MF-U D**

Note: The two pieces are provided as one set.

Mitutoyo



Polarization Unit

Order No.	**378-092** (For both the bright-field model and the bright-field and dark-field model) Each polarizer/analyzer is provided as a one-piece set.
Applicable model	**MF-U C / MF-U D**

Differential Interference Contrast Unit

Order No.	**378-080** (for 5X and 10X) **378-079** (for 20X) **378-078** (for 50X and SL20X) **378-076** (for 100X, SL80X, and SL50)
Applicable model	**MF-U C / MF-U D**

Note: Use this with a polarization unit.

Illumination Filter

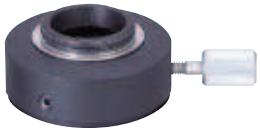
For halogen illumination for a microscope*	GIF filter	**12AAA645**
	LB80 filter	**12AAA646**
	ND2 filter	**12AAA643**
	ND8 filter	**12AAA644**
For a light source of reflected illumination (for 100 W fiber illumination)	GIF filter	**12AAG806**
	LB80 filter	**12AAG807**

*MF C (for both transmitted illumination and reflected illumination), MF-U C (only for transmitted illumination)

Stage Micrometer

Order No.	**375-056**
Scale length	1mm
Minimum graduation	0.01mm
Scale accuracy (20°C)	1+L(μm). L: length between any two lines (mm)
Scale	Negative type / Positive type
External dimensions (mm)	76(W)×26(D)
Mass	16g
Applicable model	**MF C/MF-U C/MF D/ MF-U D**

Note: After purchasing the product, we perform calibration. For details, contact a sales office near you.



C-Mount Adapter

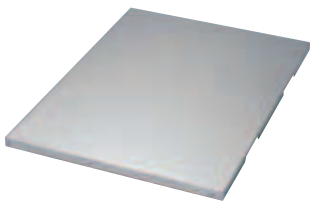
Order No.	**970441**
	This standard adapter is used to mount a device such as a digital camera to the TV camera port of a microscope. Note: This is not used when the Vision Unit is mounted.
External dimensions (mm)	ø45×22.5(H)
Applicable model	**MF C / MF-U C / MF D / MF-U D**

0.5X TV Adapter (Including C-Mount Adapter)

Order No.	**375-054**
	This standard adapter is used to mount a device such as a digital camera to the TV camera port of a microscope. This adapter enables observation with a wide field of view using a 0.5X minimum relay image. Magnification accuracy: ±0.1%, Image field diameter: 11mm Note: This adapter is included with the Vision Unit as standard.
External dimensions (mm)	ø45×123(H)
Applicable model	**MF C / MF-U C / MF D / MF-U D**

Lens Cleaning Set

Order No.	**12AAA165**
	This exclusive set includes cleaner, cloth, a blower, cotton wads, and other items for maintaining eyepieces and objectives.



Mounting Stand (for Microscope)

Order No.	**176-309**
Maximum loading	300kg
External dimensions (mm)	1200(W)×900(D)×650(H)
Mass	Approximately 50kg
Applicable model	**MF C / MF-U C / MF D / MF-U D**

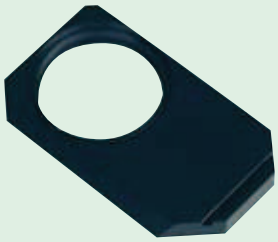
Note: When specifying a microscope with the Vision Unit or DV-520L, we recommend selecting the large mounting stand No. **960945**, which has external dimensions of 1,800(W)×900(D)×740(H).

Vibration Damping Stand

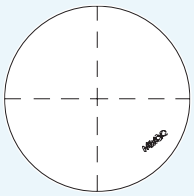
Order No.	**176-308**
Supporting method	Spring pad
Maximum loading	200kg
External dimensions (mm)	750(W)×550(D)×36(H)
Mass	36kg
Applicable model	**MF C / MF-U C / MF D / MF-U D**

Other Optional Accessories
Reticles

For MF C / MF D



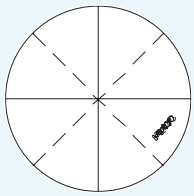
For MF-U C / MF-U D



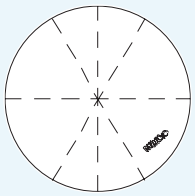
No.12AAG838 (MF C / MF D)
No.12AAG878 (MF-U C / MF-U D)
90° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 7µm

No.12AAG836 (MF C / MF D)
No.12AAG877 (MF-U C / MF-U D)
90° chain line
Chain line pitch: 0.2 to 0.2
Line width: 5µm

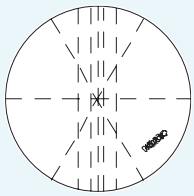
No.12AAG873 (MF C / MF D)
No.12AAG876 (MF-U C / MF-U D)
90° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 3µm



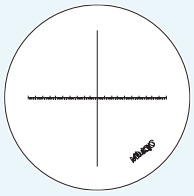
No.12AAG839
(MF C / MF D)
No.12AAG879
(MF-U C / MF-U D)
90° solid lines, 45° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 5µm



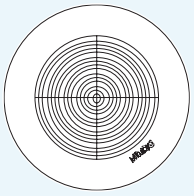
No.12AAG840
(MF C / MF D)
No.12AAG880
(MF-U C / MF-U D)
90° chain lines, 60° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 5µm



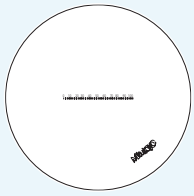
No.12AAG841
(MF C / MF D)
No.12AAG881
(MF-U C / MF-U D)
Zeiss type pattern
Chain line pitch: 0.2 to 0.2
Line width: 5µm



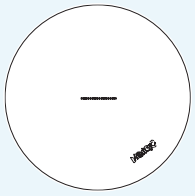
No.12AAG842
(MF C / MF D)*1
Cross haired graduation lines
0.1/20mm
Line width: 7µm



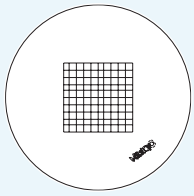
No.12AAG843
(MF C / MF D)*1
Concentric circles with
graduation lines
ø1.2 to ø18
Line width: 7µm



No.12AAG844
(MF C / MF D)*1
Graduation lines
0.1/10mm
Line width: 10µm

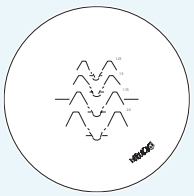


No.12AAG845
(MF C / MF D)*1
Graduation lines
0.05/5mm
Line width: 10µm



No.12AAG846
(MF C / MF D)*1
□ Grid lines
1mm 10mm
Line width: 10µm

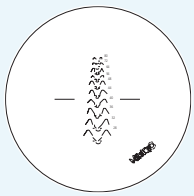
No.12AAG847
(MF C / MF D)*2
Metric coarse screw thread
p = 0.25 to 1.0
Line width: 7µm



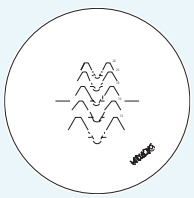
No.12AAG848
(MF C / MF D)*2
Metric coarse screw thread
p = 1.25 to 2.0
Line width: 7µm

No.12AAG849
(MF C / MF D)*2
Involute gear reference rack
m = 0.1 to 1.0, pressure angle: 14.5°
Line width: 7µm

No.12AAG850
(MF C / MF D)*2
Involute gear reference rack
m = 0.1 to 1.0, pressure angle: 20°
Line width: 7µm

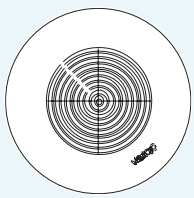


No.12AAG851
(MF C / MF D)*2
Unified coarse screw thread
80 to 28
Line width: 7µm



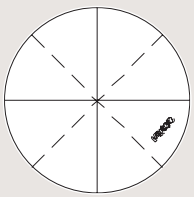
No.12AAG852
(MF C / MF D)*2
Unified coarse screw thread
24 to 14
Line width: 7µm

No.12AAG853
(MF C / MF D)*2
Unified coarse screw thread
13 to 10
Line width: 7µm



No.12AAG854
(MF C / MF D)*2
Concentric circles with cross hairs
0.01" to 0.20"
Line width: 7µm

Reticle for digital protractor eyepiece
(included as standard)



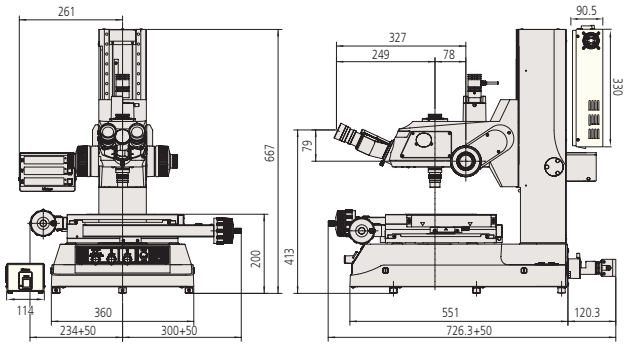
90° solid lines, 45° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 7µm

Each reticle includes an attachment board.
*1. Use this with an eyepiece that has 10X magnification.
*2. This is the comparison chart specific to a 3X ML objective. Use this with an eyepiece that has 10X magnification.

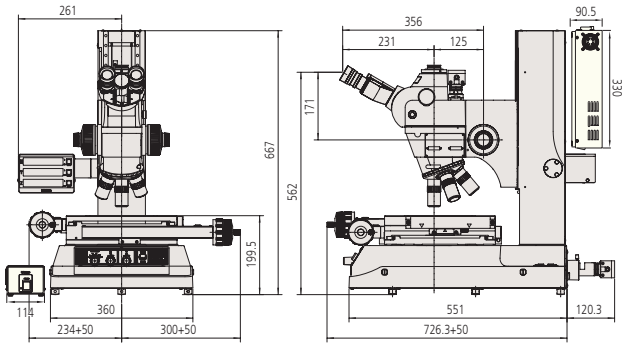
External Dimensions

The LED illumination unit is included in the following figures.
The control unit is placed to the side of the microscope or directly attached to the rear of the column
For the external dimensions for MF-D / MF-UD, please contact with your local Mitutoyo sales office.

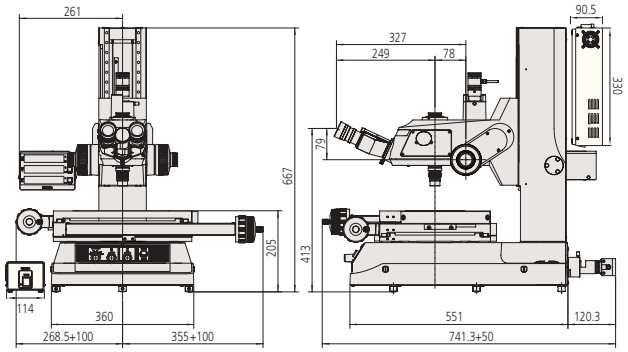
MF C 1010



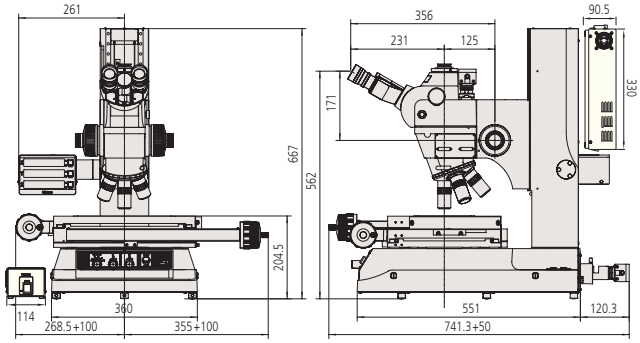
MF-U C 1010



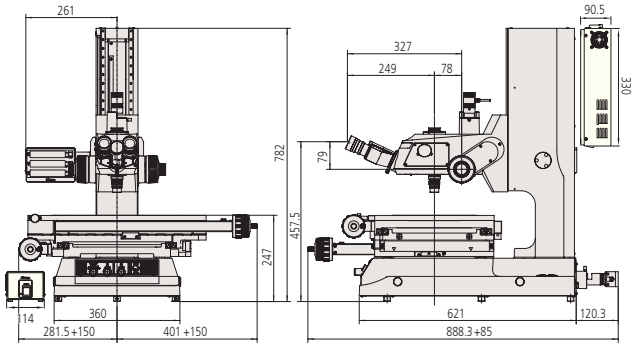
MF C 2010



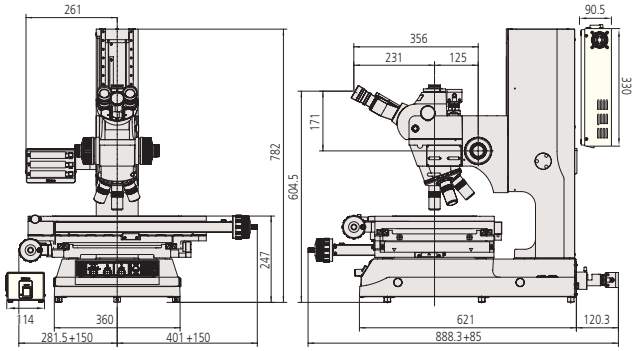
MF-U C 2010



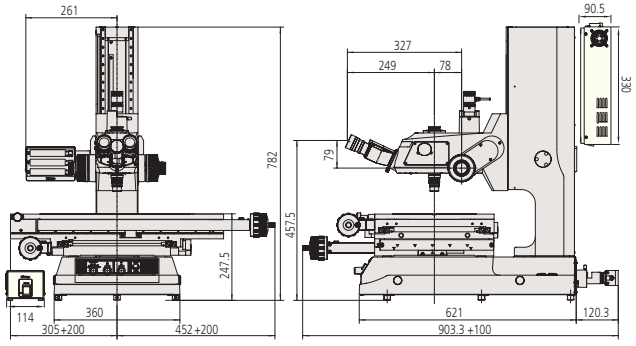
MF C 3017



MF-U C 3017



MF C 4020



MF-U C 4020